

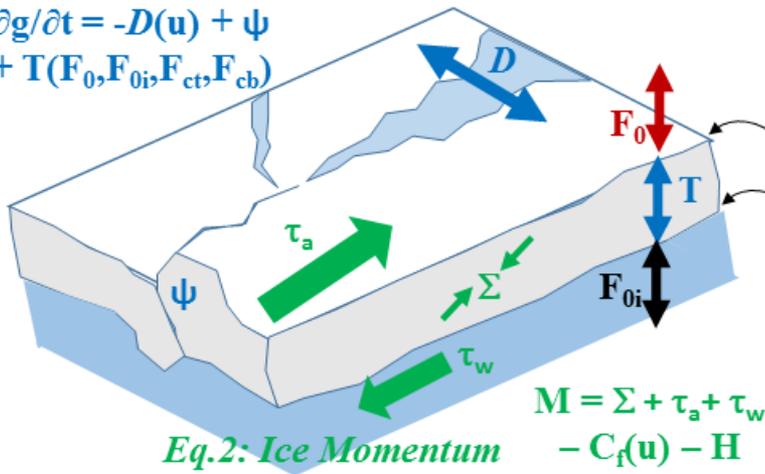
# Thermodynamic and dynamic drivers of the Arctic sea-ice mass budget

An NSF/NOAA-funded MOSAiC activity

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*Eq.1: Change of Ice Concentration*

$$\frac{\partial g}{\partial t} = -D(\mathbf{u}) + \psi + T(F_0, F_{0i}, F_{ct}, F_{cb})$$

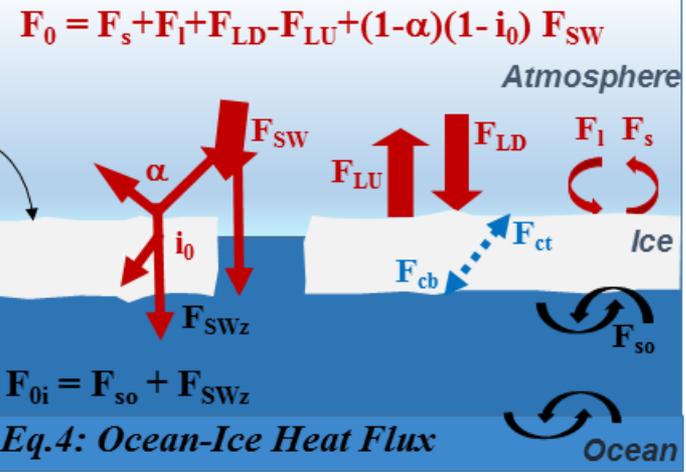


*Eq.5: Ice Melt/Growth*

$$dh/dt \propto F_0 - F_{ct}$$

$$dh/dt \propto F_{cb} - F_{0i}$$

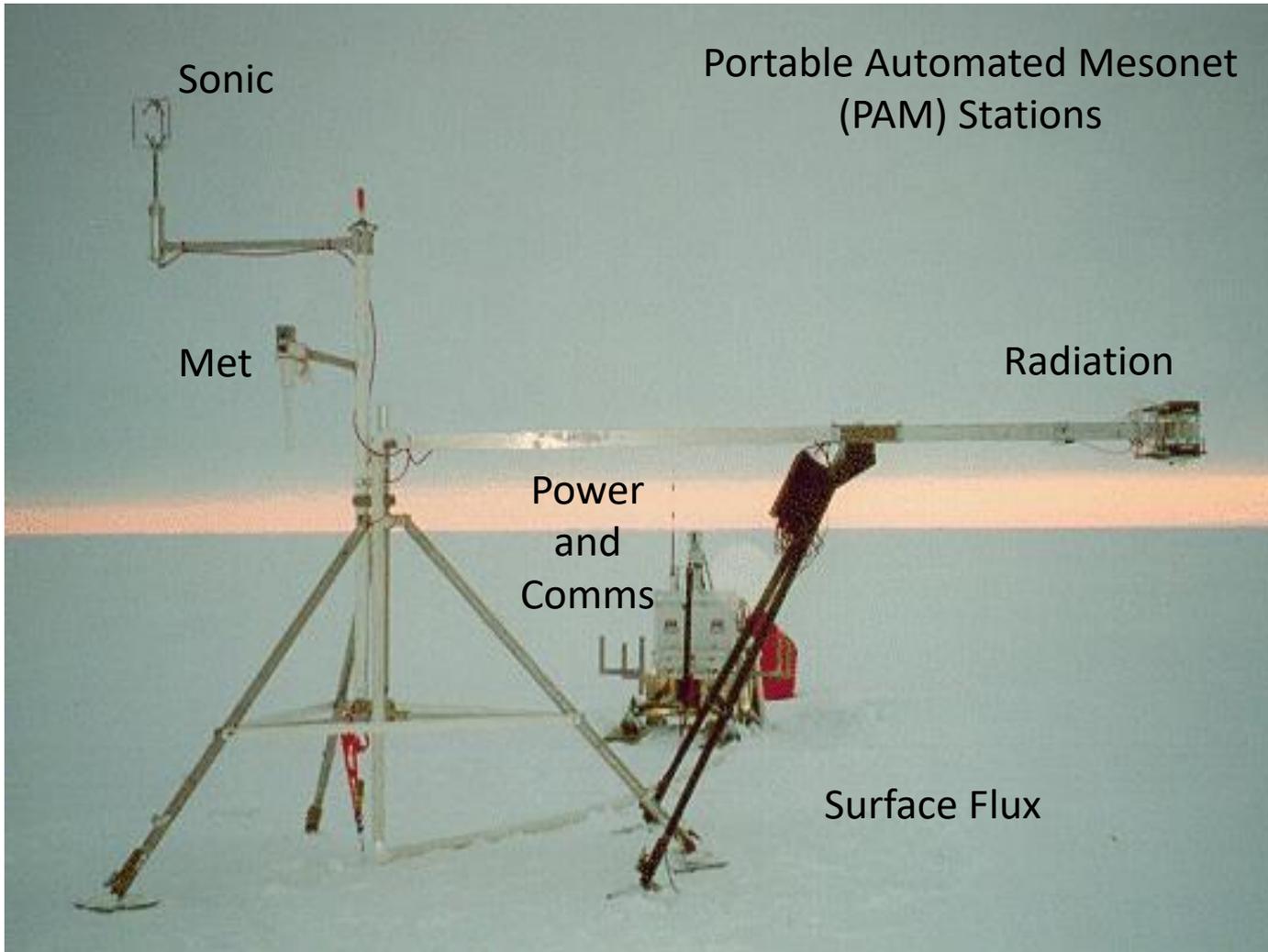
*Eq.3: Atmos.-Ice Heat Flux*



# Science Questions/Objectives

- Can we obtain closure between ice thickness and energy fluxes?
- Can we obtain closure between ice volume, energy fluxes, and ice divergence over a domain?
- Develop surface energy budget process relationships over sea ice.
- Over which time scales do thermodynamic vs. dynamic processes dominate sea-ice forecasts?

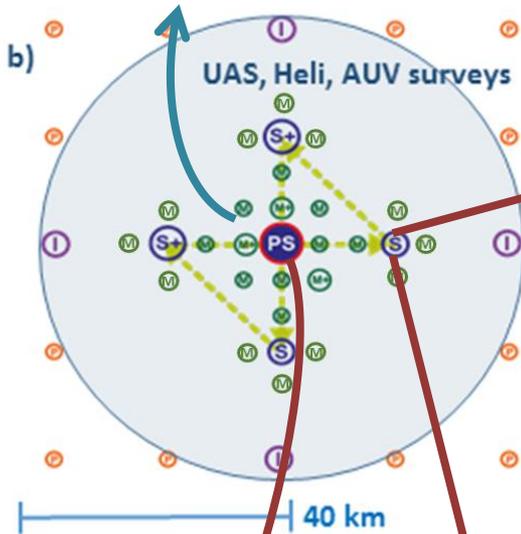
# Atmospheric Surface Flux Stations



Deployed at multiple locations during SHEBA with mixed success

# Installations

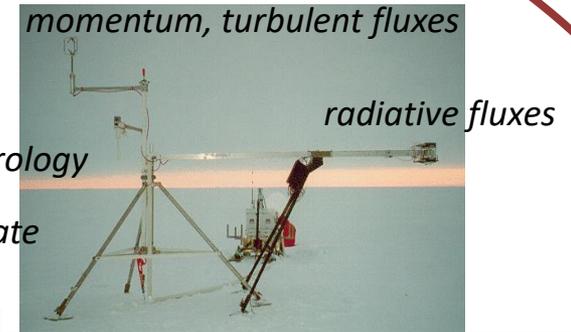
GPS buoy array (30-40)  
Drift, deformation



Atmospheric Met Tower

4 x Flux Nodes

Atmospheric Surface Flux (ASF)

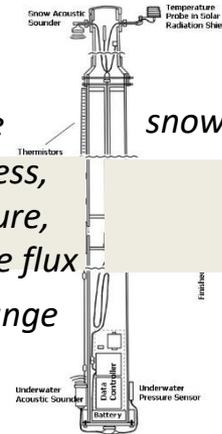


Seasonal Ice Mass Balance (SIMB)

top height change  
ice thickness,  
temperature,  
conductive flux

snow depth

bottom height change

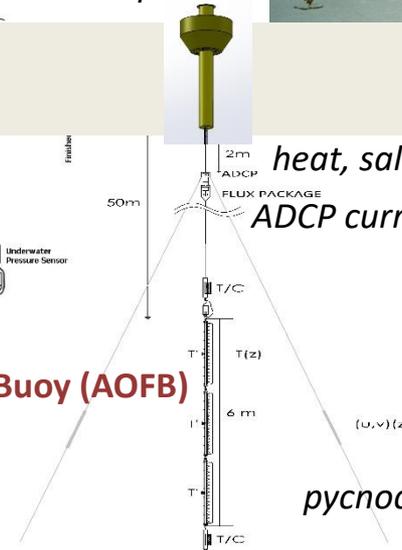


Sea ice

heat, salt, momentum flux, optics

ADCP current profile

Autonomous Ocean Flux Buoy (AOFB)

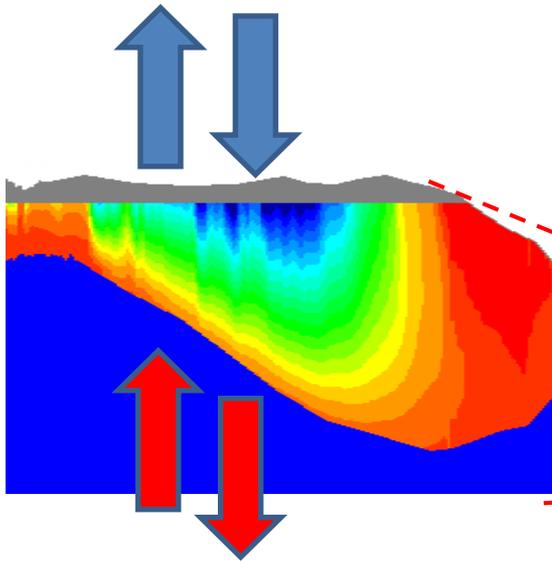


pycnocline diffusivity, heat flux

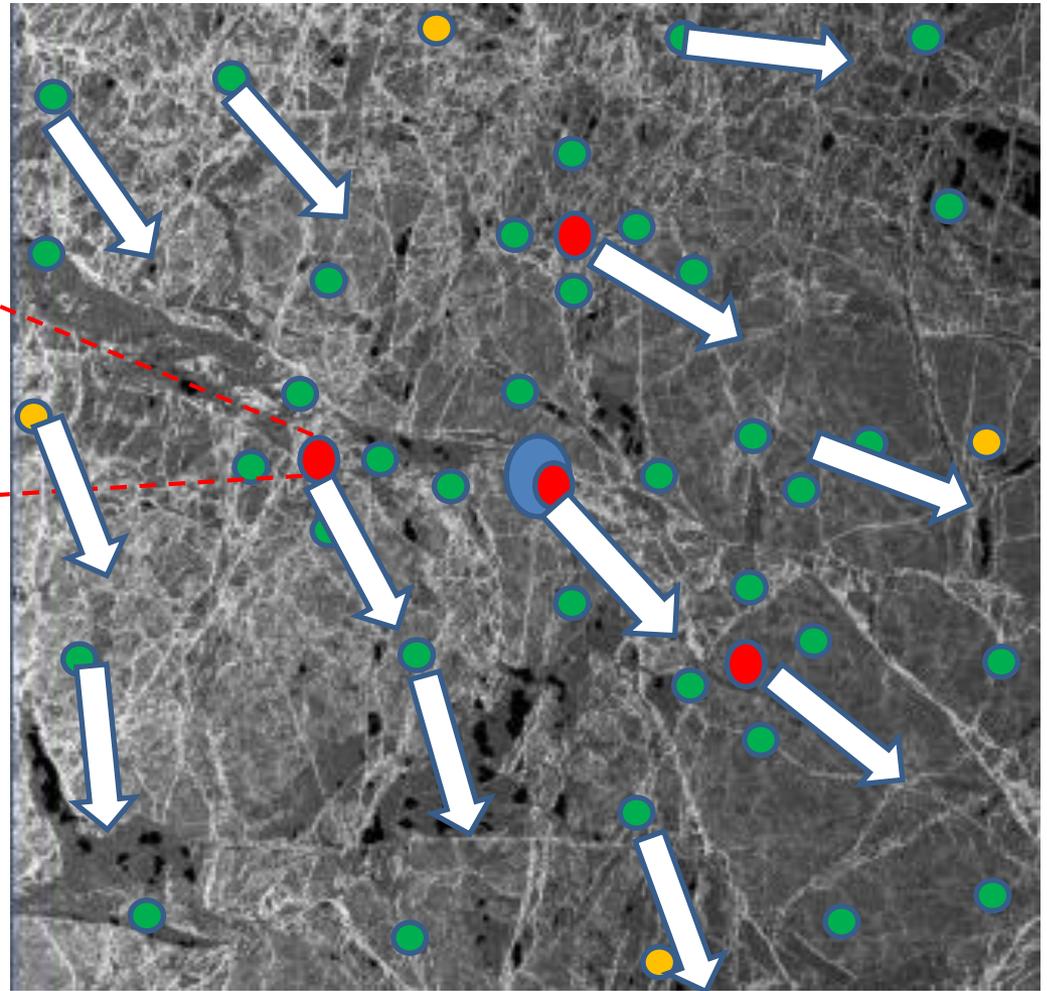
# Processes Impacting Sea Ice

MOSAiC  
Distributed  
Network

Thermodynamic balance



Dynamic impacts >>  
Momentum transfer,  
motion and deformation



~40 km